Trigger Needs - Heavy Flavor Physics

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- Physics Topics and their Triggers
- L0 Trigger
- L2 Trigger

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Physics Topics and their Triggers

- Open charm via D^0, $D^{\pm}$, D*
  - central trigger (10%)
  - minimum bias trigger
  - peripheral trigger (40-80%)
    - N.B. Also very important for v_2 of □, □ measurement!
- Quarkonium
  - J/□
    - minimum bias trigger
    - central trigger (10%)
    - J/□ L0+L2
      - L0 = peripheral + J/□ topology
      - L2 with dedicated J/□ algorithm
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    - L0+L2
      - L0 = minimum bias + single high-tower
      - L2 with dedicated algorithm

Document with detailed trigger study for J/□ and coming really soon now!

L0 Trigger (Part I)

- Peripheral Trigger (Open charm and possibly J/ψ)
  - Needs: `thr1 < CTB < thr2`
  - Eleanor's page: 3 CTB thresholds available
    - `thr3` for central trigger
    - `thr2` ~40%, `thr1` ~80% ⇒ allows peripheral ~40-80%

- min bias + HT-BEMC1 (TCU bit 10) at E=3-3.5 GeV
  - L0 rate to L2 ~ 150 Hz at peak $\mathcal{L}$

The low HT-BEMC1 threshold might (?) interfere with the high-pt pwg proposal. Proposal not specific on threshold but says they need two, i.e. all that are available:

Solution: They live with low HT-BEMC1 and run dedicated high-pt-pwg L2 algorithm
Advantage: allows cleaner cuts (calibration, clustering, etc.)

L0 Trigger (Part II)

- J/
  - peripheral + L0-Topology
  - Again: need low threshold (E=1.2-1.8 GeV) for the L0 Topology, i.e. we need a very low threshold.

L2 Trigger (part I)

- Will probably run 2 different algorithm for and J/
- Requirements:
  - Need data from: BBC, ZDC, BEMC, CTB
    - Eleanor's web page: all there, OK
  - Need calibration constants and pedestals hard coded in header file
    - but also need to keep track of them over time
    - Solution: auto-generate header files from DB (done in L3)
    - N.B. implies we need interface to DB
  - L2 rate at max. predicted $\mathcal{L} \sim 750$ Hz
  - Need bookkeeping of events inspected if we ever want to normalize
    - scaler !
  - Need defined L2 framework with plug-in for algorithm and APIs for data input and output

L2 Trigger (part II)

- Parameter input via run-control
  - also automatically to DB (Jeff put that already in place)
  1. L0 threshold
  2. L2 energy threshold
  3. max cos(θ) cut
  4. mass cut min
  5. mass cut max
  6. CTB-EMC match on/off
  7. vertex finding on/off

- Questions
  - timing of data transfer DAQ → L2?
  - max. time L2 algorithm can take?
  - How do we organize interaction between HF and L2 crew?
    - implementing algorithm needs close collaboration
    - L2 workshop?